Human Systems Integration

HSI at 711 HWP – What's New

HFE TAG #68

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U.S. AIR FORCE

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Human Systems Integration Directorate
711 HPW/HP

Mission

Optimize warfighter capability through a human-centric approach to system development, acquisition and sustainment

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Bottom Line Up Front

- **Currently amidst a significant push to *re-energize* HSI throughout the Air Force**
- **HSI implementation throughout the Air Force System Acquisition Life-Cycle is ongoing**
- **Still many challenges ahead**

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OVERVIEW

- History
- Organization
- HSI in the AF
- HSI examples
- HP Role in Acquisition and Medicine
- HSI Case Studies
- Challenges: USAF SAB Report
- Current Progress
- Future Directions

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History

2004

USAF SAB on Human Systems Integration in Air Force Weapon Systems Development and Acquisition convened.

Report identified and made recommendations to address deficits in USAF HSI capabilities.

2005

Air Force Human Systems Integration Office (AFHSIO) established under AF/CV as focal point for establishing USAF HSI policy.

2008

Human Performa
established withi
acquisition programs

MAJCOM HSI teams established

USAF Pilot-Physician Program accepts HSI as core competency

2011

BRAC

711 HPW relocated to WPAFB, consolidating:

- Human Effectiveness Directorate
- USAF School of Aerospace Medicine
- Human Systems Integration Directorate

Relocation leverages capabilities of:

- Air Force Research Laboratory
- Air Force Life Cycle Management Center
- 711Human Performance Wing
- Naval Medical Research Unit Dayton

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History

2012

HSI HPT: Develop a decision brief to SAF/AQ, AF/SG, and AFLCMC/CC with recommendations to "re-energize HSI in the USAF."

HP directorate rapidly deploys HSI capability:
- Growth from 4 to 27 HSI SMEs
  - 5 MAJCOMs
- 10 programs
  - 6 AFMS initiatives
- HSI requirements generation

2013

HSI HPT Outcomes:
- AFRL-LCMC Center-Level Agreement
- Inform Decision Makers of HSI issues and risks
- Standardize processes, tools and metrics
- Enhance education, training and competencies

Established support to LCMC Program Executive Offices

2014

Establish HSI team at Global Strike Command

HP expanded to 49 Positions

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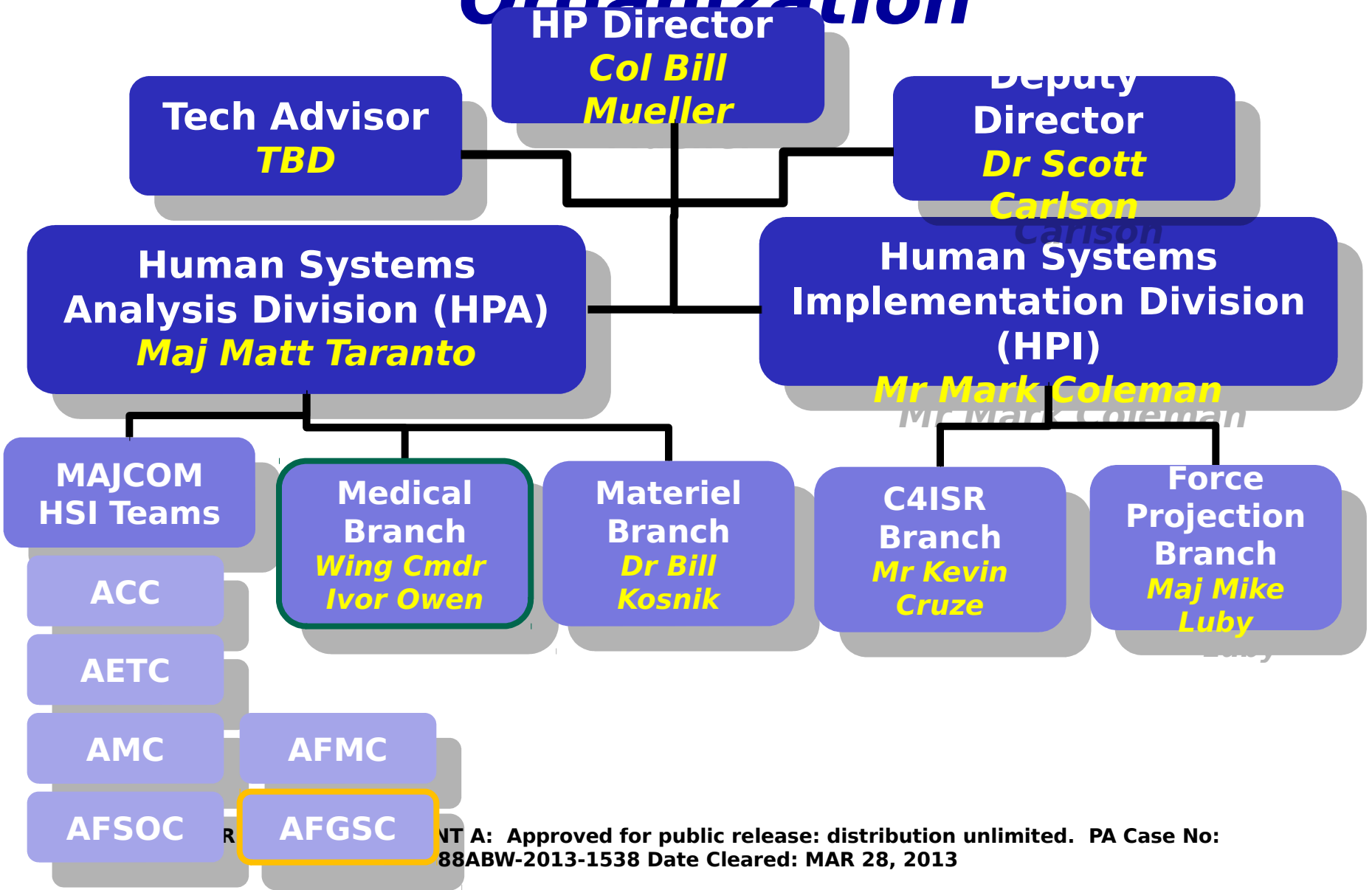
HSI Directorate Organization



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HP Organization

- **Four focus areas…**

Medical

Materiel

C4ISR

Force Projection

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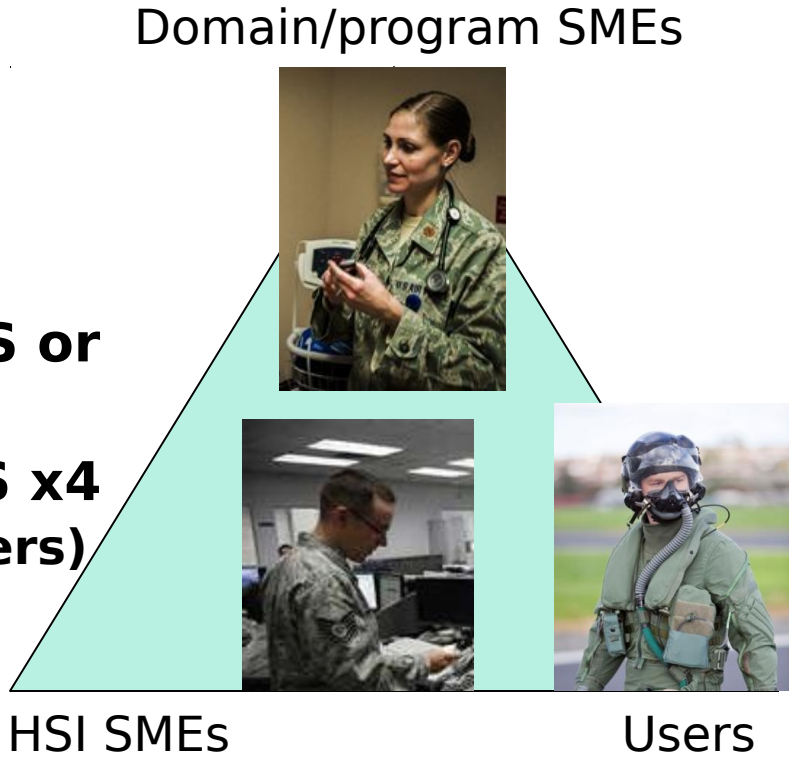
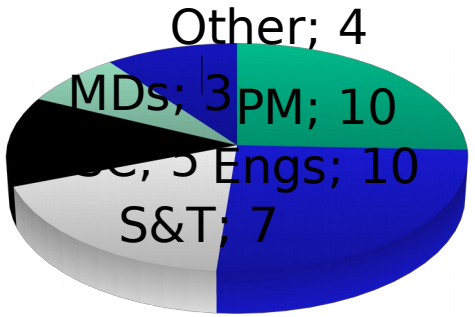
What resources do we utilize? PEOPLE

- **38 Personnel**
  - **MD x3**
  - **PhD x3**
  - **HSI Masters x1**
  - **HSI certification x16 (NPS or WDETP)**
  - **Currently enrolled at NPS x4 (2 Certificate, 2 Masters)**
- **Career Fields**
  - **Program Managers x10**
  - **Engineers x10**
  - **Scientists x7**
  - **Biomed Service Corp x5**
  - **Medical Doctors x3**
- **Expertise in all 9 AF HSI domains…**





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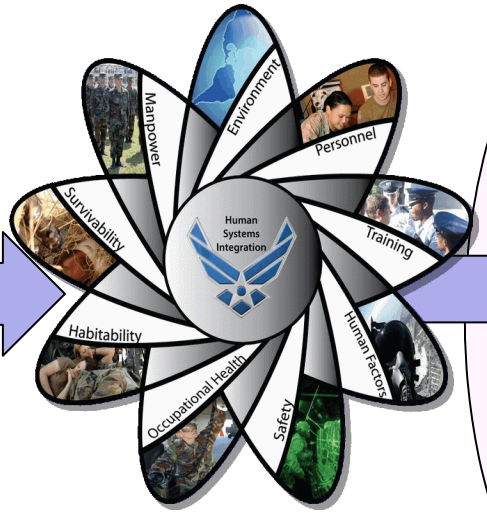
HP Role in AF System Acquisition

HSI Practitioner



Integration

Air Force System

Total System Performanc e

Mission Success

Deliverables

--HSI ***risk assessments*** at key program decision points
--***Inform*** decision makers
--Provide ***risk reduction***
--Optimize human ***performance***
--Reduce life cycle ***costs***

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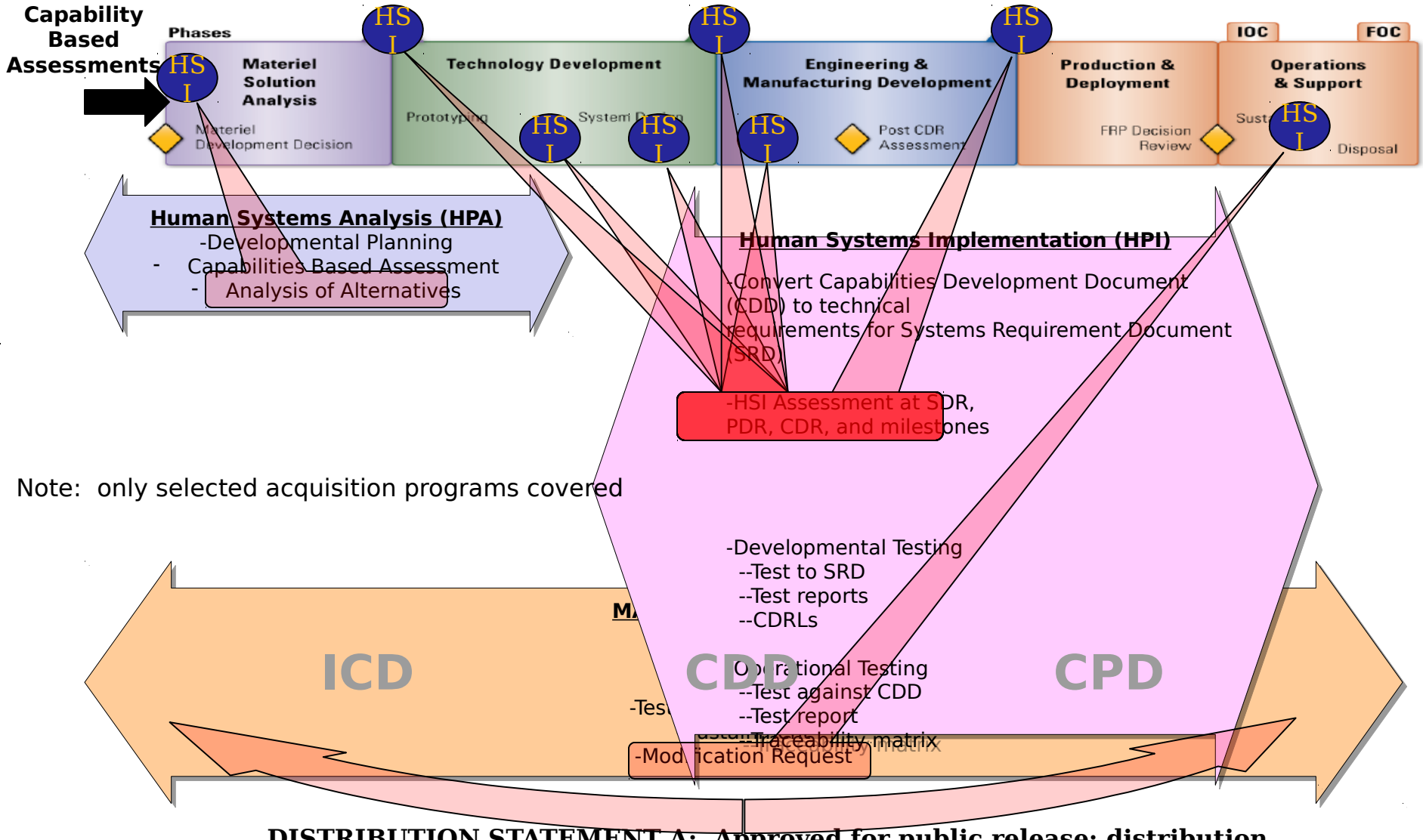
HSI involvement in System Acquisition



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HSI Involvement in 'notional' SPO

The PM is ultimately responsible for ensuring that HSI is considered

HSI: Optimizes across domains and provides recommendations to SE regarding total system performance

SE: Optimizes across subsystems to meet required system specifications

Program Manager

Systems Engineer

Flight Controls | Comms | Radar | Navigation | ECS | Airframe | HSI

Domain SMEs also provide input to HSI for *integration* and *optimization*

Domain SMEs: Provide domain input to meet system specs

HFE | Personnel | Training | Manpower | ESOH | Habitability | Survivability

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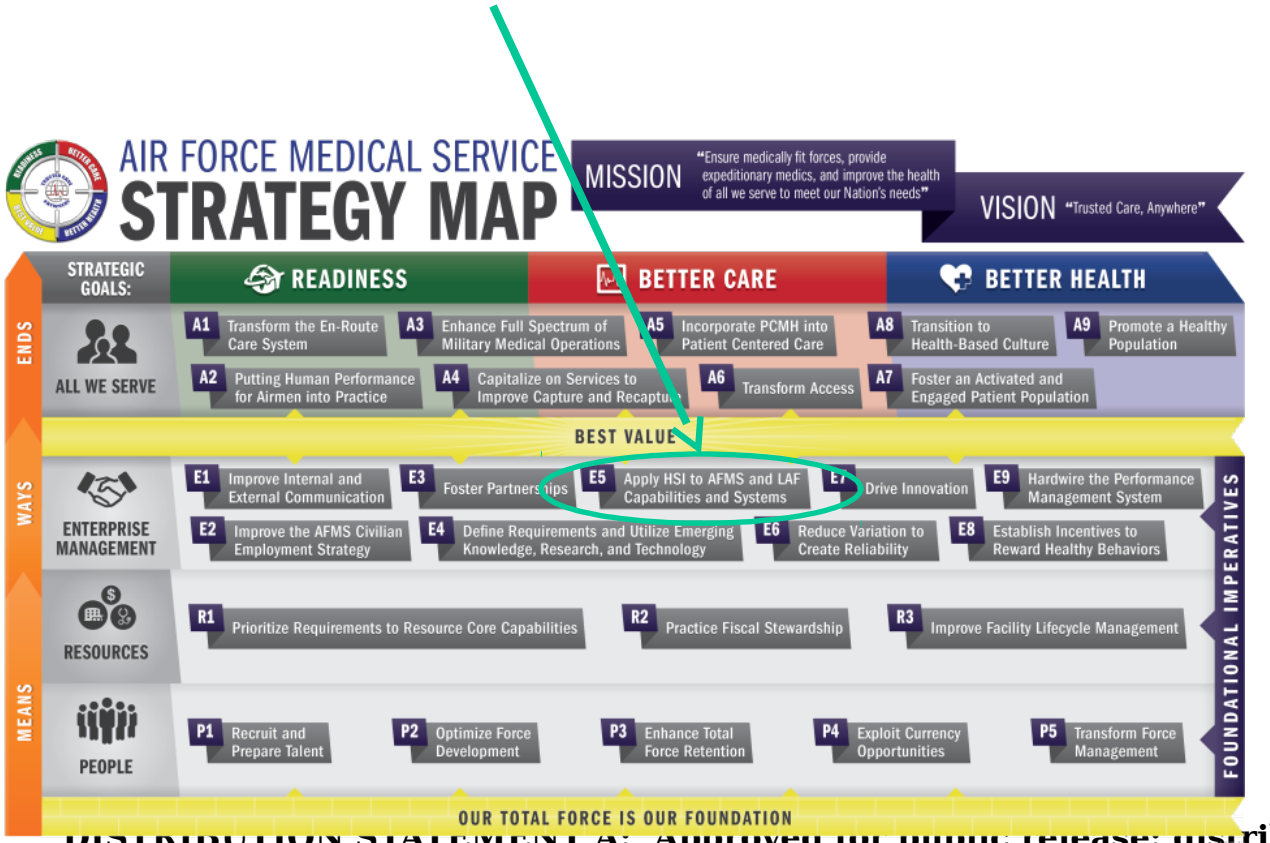
HP role in AFMS

- **Improved healthcare workflow & process management (e.g. Base Operational Medicine Cell)**
- **Strategic Map Objective E5 "Apply HSI to AFMS and LAF capabilities and systems"**


AIR FORCE MEDICAL SERVICE
STRATEGY MAP
MISSION "Ensure medically fit forces, provide expeditionary medics, and improve the health of all we serve to meet our Nation's needs"
VISION "Trusted Care, Anywhere"
STRATEGIC GOALS:
READINESS
BETTER CARE
BETTER HEALTH
ENDS
ALL WE SERVE
A1 Transform the En-Route Care System
A3 Enhance Full Spectrum of Military Medical Operations
A5 Incorporate PCMH into Patient Centered Care
A8 Transition to Health-Based Culture
A9 Promote a Healthy Population
A2 Putting Human Performance for Airmen into Practice
A4 Capitalize on Services to Improve Capture and Recaptu
A6 Transform Access
A7 Foster an Activated and Engaged Patient Population
BEST VALUE
WAYS
ENTERPRISE MANAGEMENT
E1 Improve Internal and External Communication
E3 Foster Partnerships
E5 Apply HSI to AFMS and LAF Capabilities and Systems
E7 Drive Innovation
E9 Hardwire the Performance Management System
E2 Improve the AFMS Civilian Employment Strategy
E4 Define Requirements and Utilize Emerging Knowledge, Research, and Technology
E6 Reduce Variation to Create Reliability
E8 Establish Incentives to Reward Healthy Behaviors
MEANS
RESOURCES
R1 Prioritize Requirements to Resource Core Capabilities
R2 Practice Fiscal Stewardship
R3 Improve Facility Lifecycle Management
PEOPLE
P1 Recruit and Prepare Talent
P2 Optimize Force Development
P3 Enhance Total Force Retention
P4 Exploit Currency Opportunities
P5 Transform Force Management
FOUNDATIONAL IMPERATIVES
OUR TOTAL FORCE IS OUR FOUNDATION

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How is HSI applied in the AFMS

- **HSI in AFMS will look different:**
  - **Core "weapon systems" are health care delivery systems (more people than technology)**
  - **Not dependent on traditional acquisition framework for primary systems; multiple entry pathways for technology (especially COTS)**
  - **Decentralized development of system**
  - **Practitioners need medical knowledge**

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Current HSI Case-studies

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Aircraft systems

- **Avionics modernization upgrades**
  - **Front-end analysis to include aircrew/mission needs, environment, operations, etc.**
  - **Ensure aircrews can effectively accomplish all missions without excessive workload or performance degradation, minimal training**
  - **Maintenance/logistics considerations**

HFE | Personnel | Training | Manpower | ESOH | Habitability | Survivability

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Aircraft systems (cont.)

- **Loading/unloading equipment & supplies**
  - **Eliminate or minimize:**
    - **Extra personnel required to handle and lift equipment**
    - **Safety mishaps due to drops, falls, equipment shifting during flight**
    - **Damage to equipment due to mishaps**

HFE | Personnel | Training | Manpower | ESOH | Habitability | Survivability

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Aircraft systems (cont.)

- **Workspace design for patient transport and medical care**
  - **Addresses aircraft & mission effectiveness**

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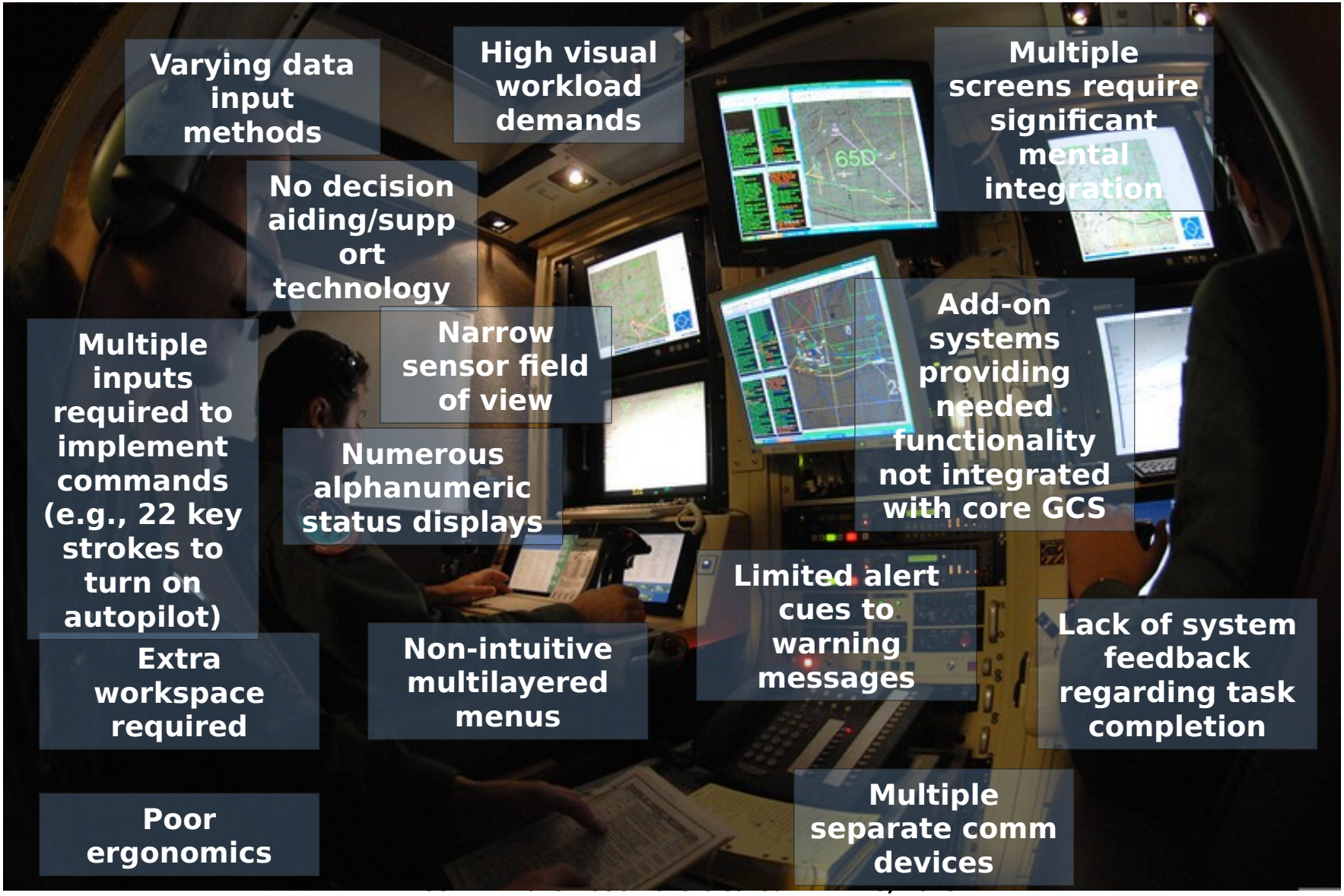
Ground Control Station


Varying data input methods
High visual workload demands
Multiple screens require significant mental integration
No decision aiding/support technology
Multiple inputs required to implement commands (e.g., 22 key strokes to turn on autopilot)
Narrow sensor field of view
Numerous alphanumeric status displays
Add-on systems providing needed functionality not integrated with core GCS
Limited alert cues to warning messages
Lack of system feedback regarding task completion
Extra workspace required
Non-intuitive multilayered menus
Poor ergonomics
Multiple separate comm devices

Aircrew Life Support Equipment

- **Developed human centric test plan for aircraft integration events**
- **Evaluated design impact on human performance and affected design changes**
- **Supported development of training requirements**
- **Conducted research to support requirements development**
- **Embraced effects-based HSI to identify performance risk of designs**

HFE | Personnel | Training | Manpower | ESOH | Habitability | Survivability

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HSI Challenges

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2012 USAF SAB Report on Aircraft Oxygen Generation

Recommendation #2:

"Re-energize the emphasis on Human Systems Integration throughout a weapon system's lifecycle, with much greater emphasis during Pre-Milestone A and Engineering & Manufacturing Development phases."

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Focus Areas

- ***Roles & Responsibilities***: **Codify the roles and responsibilities, organizational relationships, HSI processes and products for the "HSI Enterprise" in AF policy and guidance**
- ***Forcing Functions***: **Drive consistent use of the existing forcing functions at key ILCM touch points to ensure HSI issues are appropriately addressed and Senior Leaders are adequately informed on HSI risks and issues**
- ***Tools & Metrics***: **Use standardized HSI tools and metrics to assist, evaluate, and report HSI activities for systems in all lifecycle phases, from Capabilities Based Assessments to Operations & Sustainment**
- ***Training & Competencies***: **Describe, develop and resource the HSI competencies required for "cradle to grave" execution of Air Force system portfolios**

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Re-energizing HSI in progress

- Supporting AFLCMC PEOs
  - Fighter/Bomber
  - Agile Combat Support
  - Mobility
  - Tanker
  - ISR & SOF
- Established JCIDS document review process
- Established support to Air Force Medical Service
- Establishing HSI team at Global Strike Command
- Ongoing workforce development and HSI training

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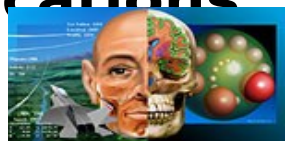
Future HSI Considerations

- Who are operators of the future?
- Operator workload/overload
- What environments will we fight in?
- Medical standards/fitness for UAS operations
- How will we train for future/nonexistent systems?
- Mental health effects of remote warfare
- Autonomous operations and HSI implications

Manpower

Personnel

Training

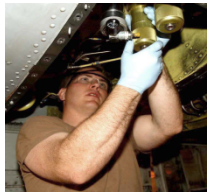


Human Factors

Personnel Survivability

Environment

Safety



Occ Health

Habitability

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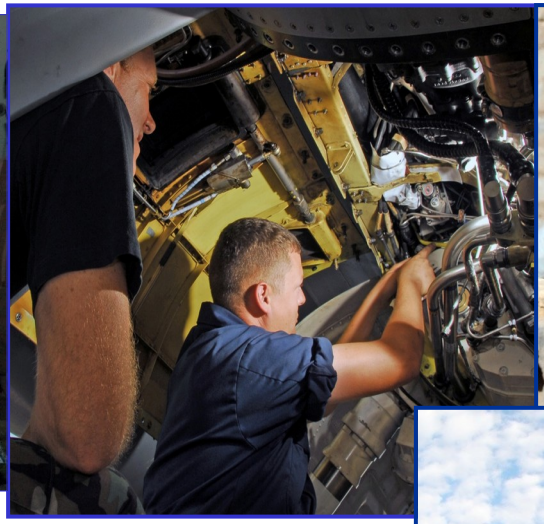
Final Message



- **HSI is part of the AF Medical and Acquisition processes**
- **HS is much more than just HFE or Occupational Health**
- **HSI <u>optimizes</u> human performance**

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Further Information

- **DoD**
  - **DoDD 5000.01, *The Defense Acquisition System***
  - **DoDI 5000.02, *Operation of the Defense Acquisition System***
  - ***Defense Acquisition Guidebook (DAG), Ch 6***
- **Air Force**
  - **AFPD 63-1/20-1, *Acquisition and Sustainment Life Cycle Management***
  - **AFI 63-101, *Acquisition and Sustainment Life Cycle Management***
  - **AFPAM 63-128, *Guide to Acquisition and Sustainment Life Cycle Management, Ch 18***
- **AFMC**
  - **AFMCI 63-1201, *Implementing Operational Safety Suitability and Effectiveness***
  - ***AFRL-LCMC Center Level Agreement***
- **DAU**
  - **CLM 041, *Human Systems Integration***
  - **CLM 101, Intro to JCIDS**
  - **ACQ 101, *Fundamentals of Systems Acquisition Management***
  - **LOG 101, *Acquisition Logistics Fundamentals***
- **AFIT**
  - **SYS 169, *Intro to Human Systems Integration***
  - ***SYS 269, Intermediate Human Systems Integration***

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Questions?

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